

## Table of Contents

1.0	INTRODUCTION.....	3
2.0	BARRIER COMPONENTS.....	4
3.0	MATERIAL SPECIFICATIONS & OVERALL DIMENSIONS .....	6
3.1	REAR HONEYCOMB BLOCK .....	6
3.2	FRONT HONEYCOMB BLOCK.....	6
3.3	BACKING SHEET .....	6
3.4	INTERMEDIATE SHEET .....	6
3.5	CONTACT SHEET .....	7
3.6	CLADDING SHEET .....	7
3.7	ADHESIVE .....	7
4.0	ADHESIVE BONDING PROCEDURE.....	8
5.0	ASSEMBLY PROCESS .....	9
5.1	Bonding Honeycomb to Aluminum Sheets .....	9
5.2	Mounting Holes and Slots.....	10
6.0	Assembly and Component Drawings .....	11

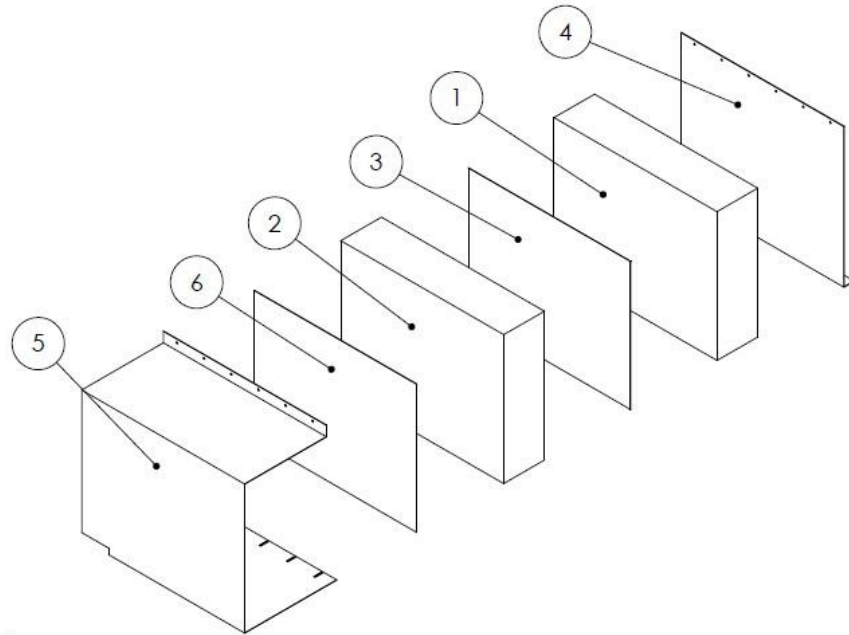
## 1.0 INTRODUCTION

The NHTSA Research Frontal Mobile Deformable Barrier v2014.1 is a 1200mm wide assembly of two layers of deformable aluminum honeycomb core. Each deformable core is 300 mm thick in the impact direction and is designed to provide a constant load in depth. The cores are adhesively bonded together with different aluminum sheets forming a ready to use deformable barrier to be fixed on a moving cart.

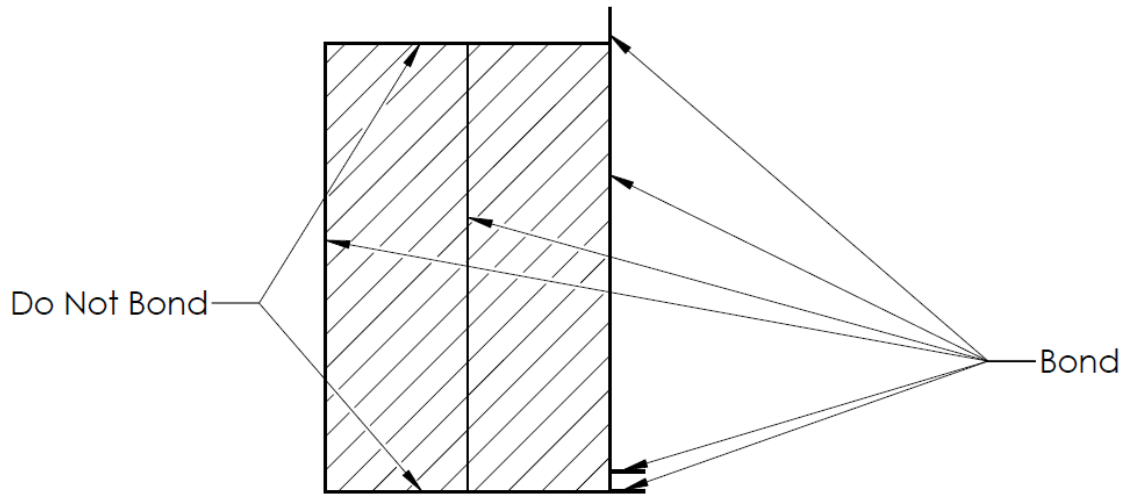
## 2.0 BARRIER COMPONENTS

The components of the barrier face are listed below and shown in Figure 1. The bonded surfaces are shown in Figure 2. The dimensions of the individual components of the barrier are listed in Section 3, with drawings found in Section 6.

1. Rear honeycomb block
2. Front honeycomb block
3. Intermediate sheet
4. Backing sheet
5. Cladding sheet
6. Contact sheet
7. Adhesive (Not Shown)



**Figure 1 Components of the Barrier**



SECTION A-A

**Figure 2 Cross-Section A-A – Adhesive Bonding of the Barrier**

### **3.0 MATERIAL SPECIFICATIONS & OVERALL DIMENSIONS**

#### **3.1 REAR HONEYCOMB BLOCK**

Dimensions:

Height (L): 950 ± 5 mm (in direction of honeycomb ribbon)  
Width (W): 1200 ± 5 mm  
Depth (T): 300 ± 1 mm (in direction of honeycomb cell)  
Material: Aluminum 3003  
Cell Size: 6.35 mm ± 20 percent  
Crush Strength: 1.711 MPa +0 percent -10 percent<sup>1</sup>

#### **3.2 FRONT HONEYCOMB BLOCK**

Dimensions:

Height (L): 950 ± 5 mm (in direction of honeycomb ribbon)  
Width (W): 1200 ± 5 mm  
Depth (T): 300 ± 1 mm (in direction of honeycomb cell)  
Material: Aluminum 5052  
Cell Size: 6.35 mm ± 20 percent  
Crush Strength: 0.724 MPa +0 percent -10 percent<sup>1</sup>

#### **3.3 BACKING SHEET**

Dimensions:

Height: 1025 mm ± 1 mm  
Width: 1200 mm ± 1 mm  
Thickness: 3.0 mm ± 0.25 mm  
Material: Aluminum Series AlMg2 to AlMg3 with hardness between 50 and 67 HBS

#### **3.4 INTERMEDIATE SHEET**

Dimensions:

Height: 945 mm ± 1 mm  
Width: 1195 mm ± 1 mm  
Thickness: 0.5 ± 0.1 mm  
Material: Aluminum 5251 H24 or Aluminum 5052 H32

<sup>1</sup> In accordance with the certification procedure described in US Department of Transportation, NHTSA Laboratory Test Procedure for FMVSS No. 214 "Dynamic" Side Impact Protection, TP214D Appendix C Latest Revision.

### 3.5 CONTACT SHEET

Dimensions:

Height: 945 mm  $\pm$  1 mm  
Width: 1195 mm  $\pm$  1 mm  
Thickness: 1.6 mm  $\pm$  0.07 mm  
Material: Aluminum 5251 H24 or 5052 H34

### 3.6 CLADDING SHEET

Dimensions:

Height: 1026 mm  $\pm$  1 mm  
Width: 1200 mm  $\pm$  1 mm  
Thickness: 0.8 mm  $\pm$  0.1 mm  
Material: Aluminum 5754 H22 or 5052 H34

### 3.7 ADHESIVE

The adhesive to be used throughout should be a Polyurethane adhesive or equivalent, with a minimum bonding strength of 0.6 MPa.<sup>2</sup>

<sup>2</sup> In accordance with the certification procedure described in ASTM C 297, using a sample of honeycomb representative of that in the impactor, bonded to a back plate material.

## **4.0 ADHESIVE BONDING PROCEDURE**

Prior to bonding, all aluminum sheets shall be cleaned and prepared to provide optimal adhesion performance. The adhesive is only applied to the aluminum sheet surfaces when bonding aluminum sheets to honeycomb surfaces.

When bonding the cladding sheet to the backing sheet and when bonding the contact sheet to the cladding sheet, the adhesive is applied to one surface only.

A maximum of  $0.5 \text{ kg/m}^2$  must be applied evenly over the surface, giving a maximum film thickness of 0.5 mm. Care should be taken to assure adhesive does not run into the honeycomb cells causing an increase in crushing strength of the honeycomb core.

## 5.0 ASSEMBLY PROCESS

### 5.1 Bonding Honeycomb to Aluminum Sheets

Verify that all surfaces are clean and prepared for bonding. The main part of the barrier face shall be assembled according to Figure 1. The rear honeycomb block shall be adhesively bonded to the backing sheet such that the cell axes are perpendicular to the backing sheet. The intermediate sheet shall be adhesively bonded to the rear and front honeycomb blocks. The cell axes of the front honeycomb block shall be perpendicular to the intermediate sheet. The contact sheet shall be adhesively bonded to the front honeycomb block. The outer cladding shall be adhesively bonded to the contact sheet. The top and bottom surfaces of the cladding sheet shall not be adhesively bonded to the main honeycomb block but should be positioned closely to it. The cladding sheet shall be adhesively bonded to the backing sheet at the mounting flanges. Bonding points can be seen in Figure 3.

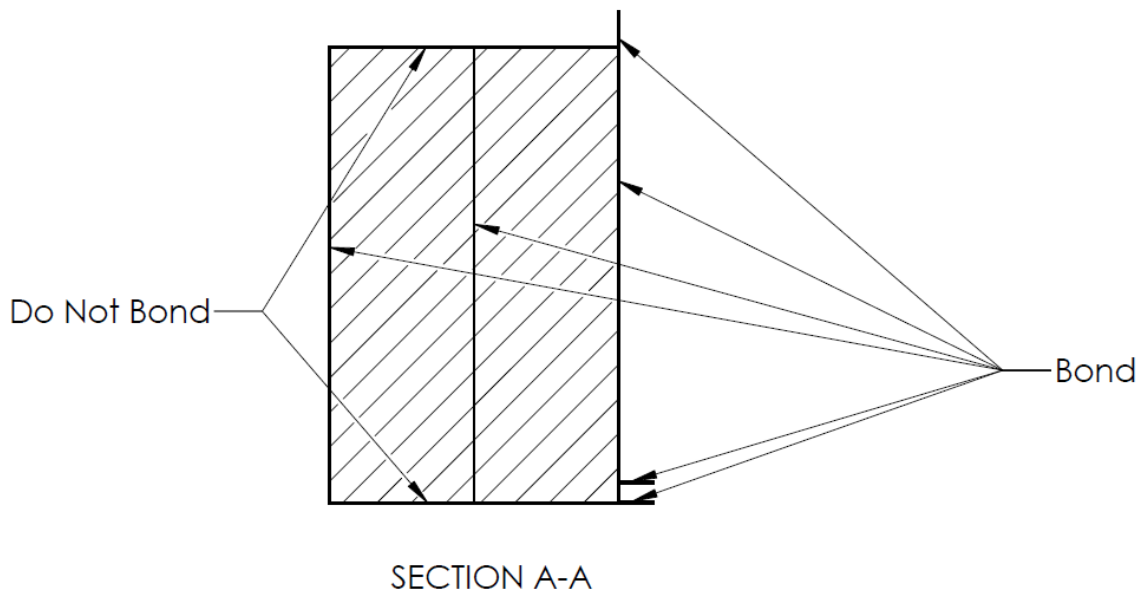


Figure 3 Main Body Assembly of the Barrier



## 5.2 Mounting Holes and Slots

The Research Frontal Mobile Deformable Barrier has clearance holes and slots for mounting of the barrier. The holes shall have a diameter of 10.5mm. Six holes shall be located in the top flange at a nominal distance of 24.3mm from the top edge of the flange and six slots in the bottom flange at a nominal distance of 36mm from the bottom edge of that flange. The holes and slots shall be at the locations shown in Figures 4 and 5. All holes and slots shall be located to  $\pm 1$ mm of the nominal distances.

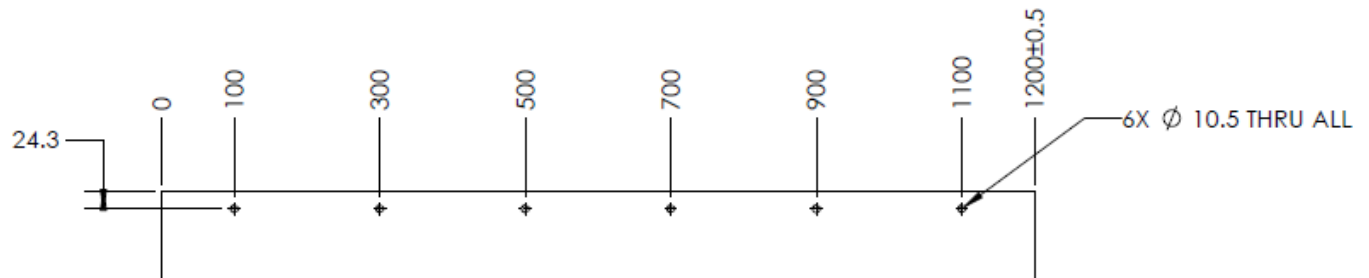


Figure 4 Top Flange Mounting Holes

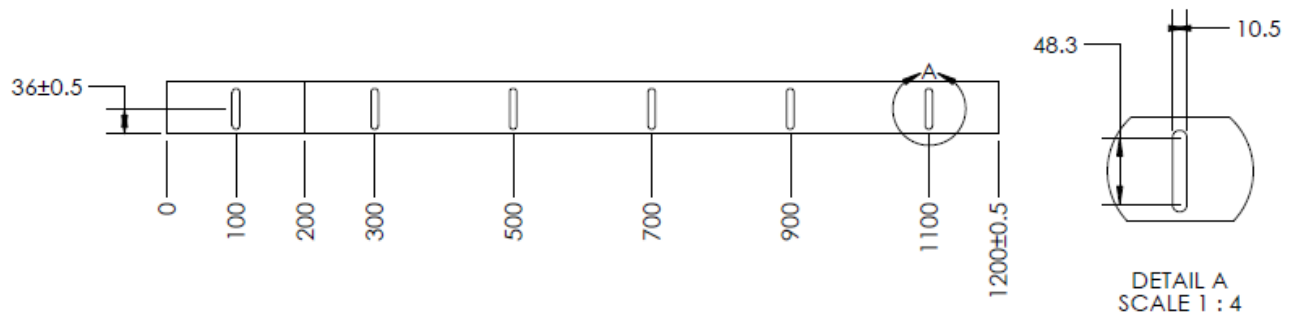


Figure 53 Bottom Flange Mounting Slots

## **6.0 Assembly and Component Drawings**

The following pages show dimensioned drawings for the components and the assembly of the NHTSA Research Frontal Moving Deformable Barrier v2014.1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	EA168-301	5.2-1/4-3003 (1.711 Mpa +0/-10%)	1
2	EA168-302	2.3-1/4-5052 (0.724 Mpa +0/-10%)	1
3	EA168-102	0.5mm +/-0.1mm AL 5052 H32 or 5251 H24	1
4	EA168-101	3.0mm +/-0.25mm AL 5052 H32 or 5251 H32	1
5	EA168-104	0.8mm +/-0.1mm AL 5052 H34 or 5251 H24	1
6	EA168-103	1.6mm +/-0.07mm AL 5052 H34 or 5251 H24	1

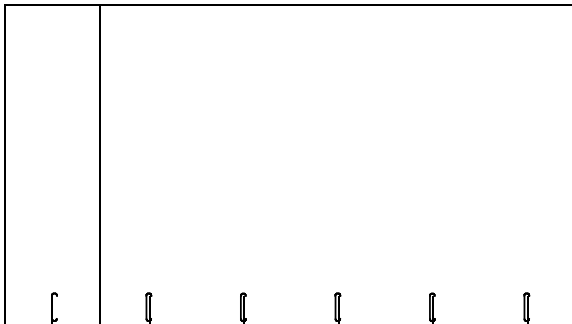
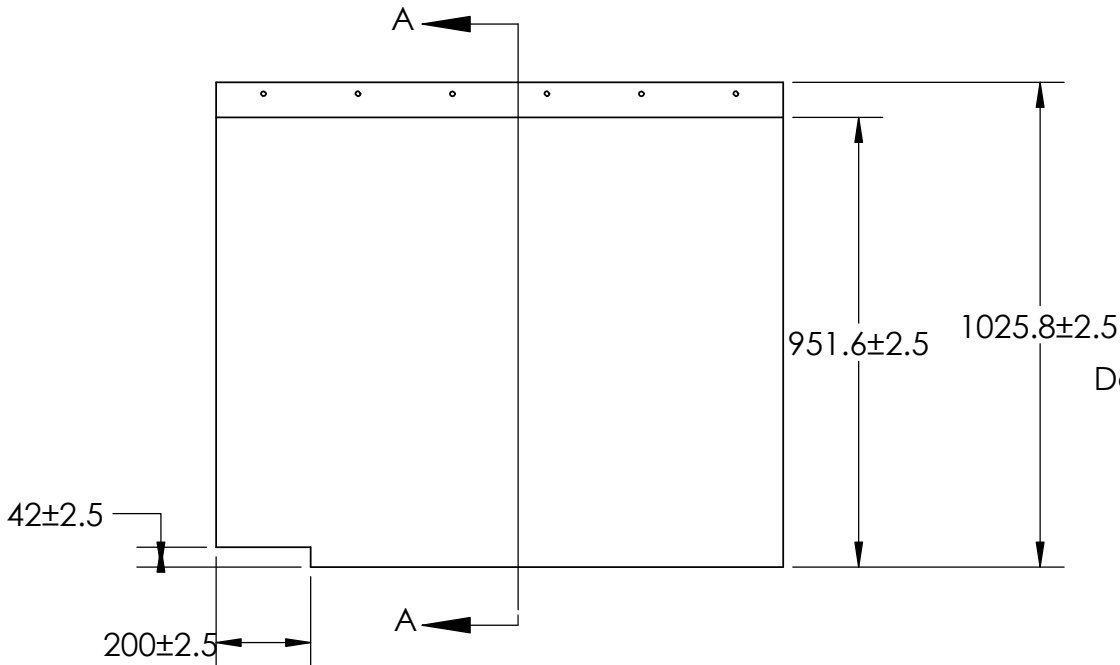
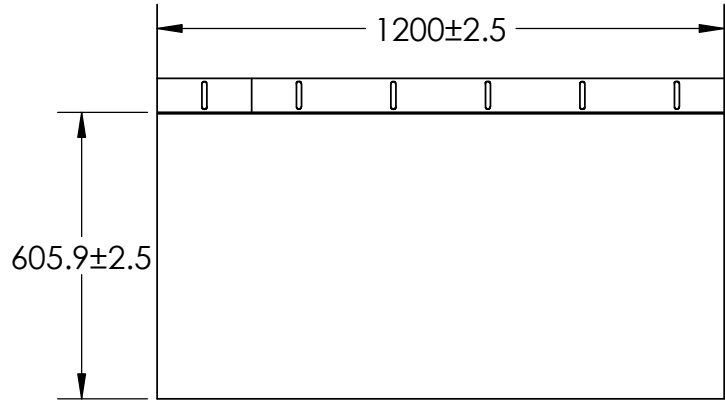
REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A1	Preliminary Release for Manufacture	10/27/14	JAE

D

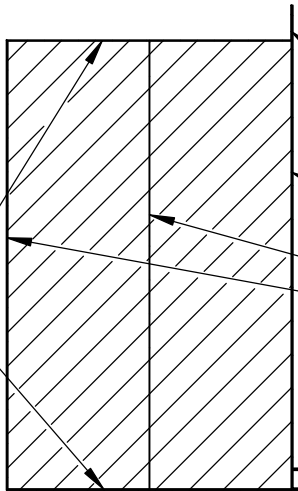
C

B

A

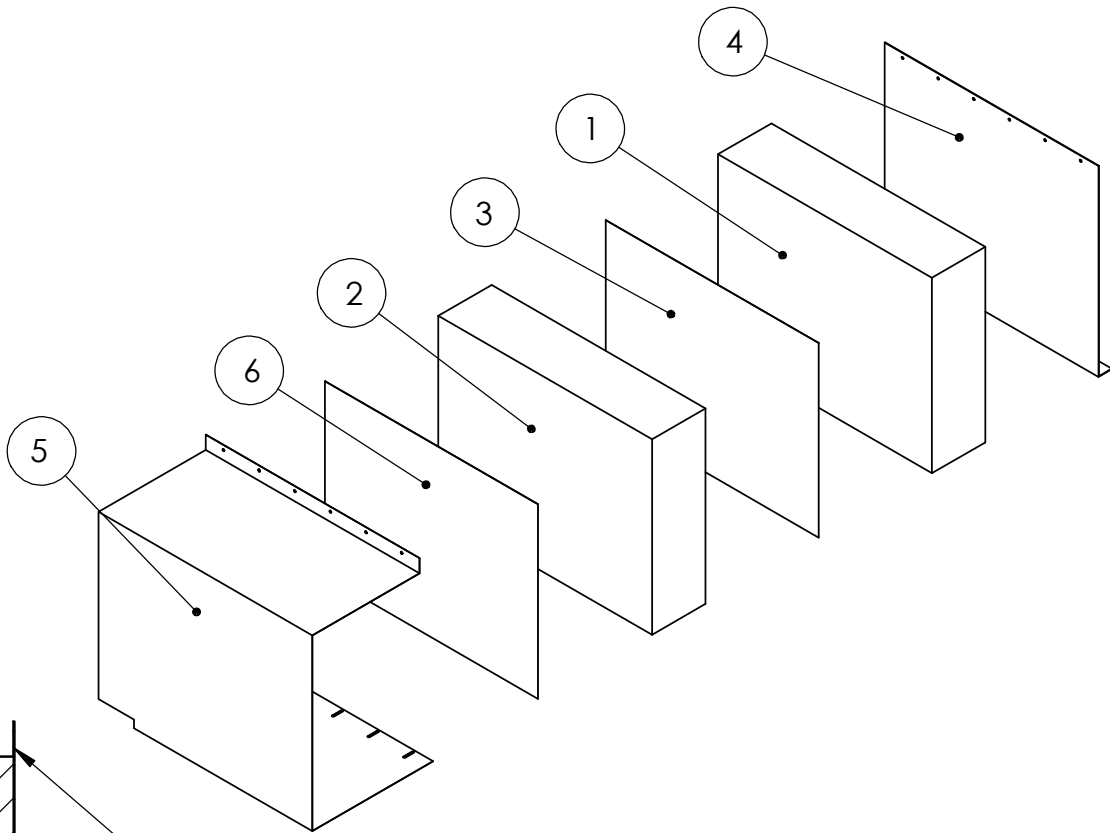


Do Not Bond



SECTION A-A

Bond with Plascore P206




D

C

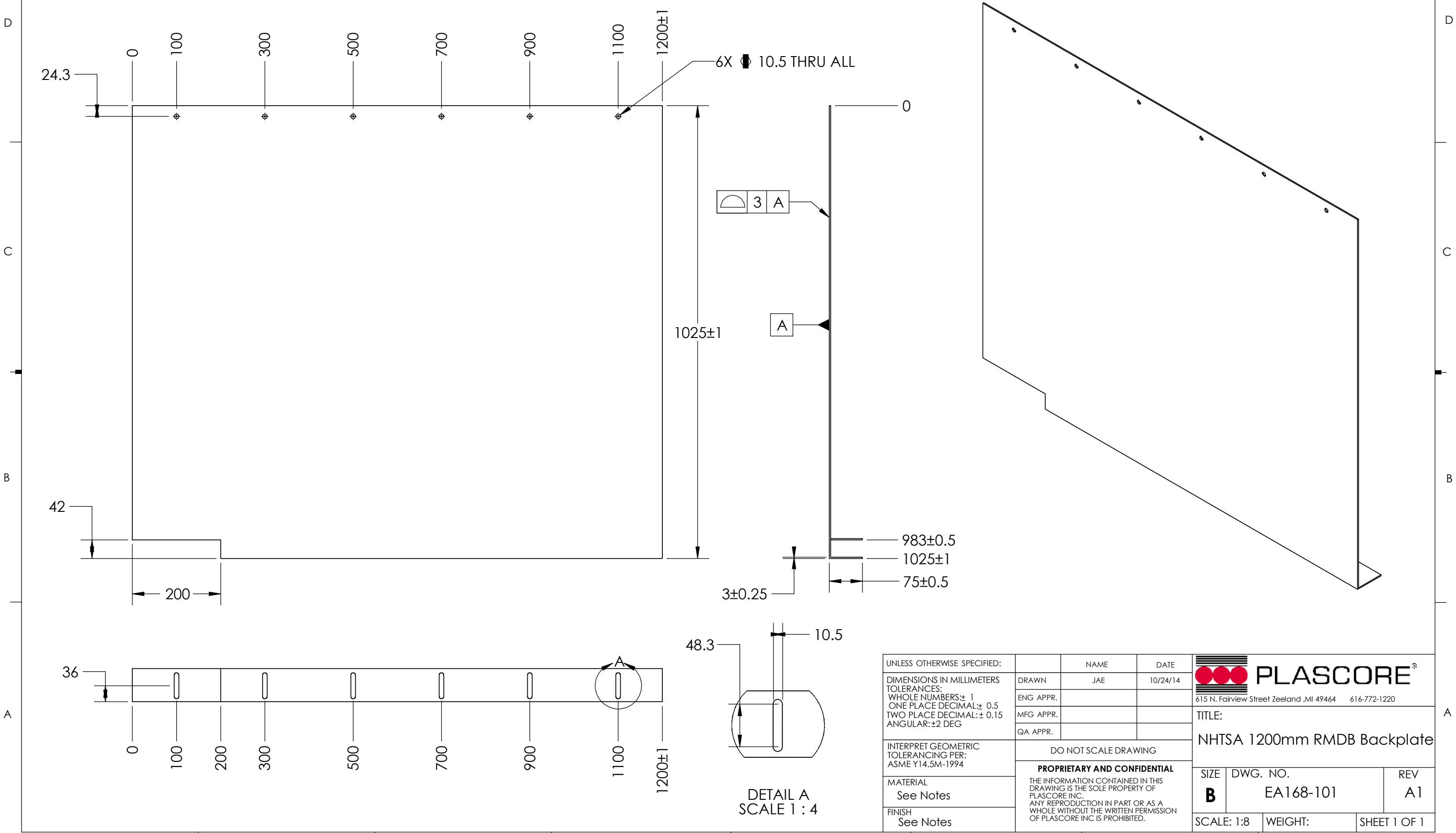
B


A

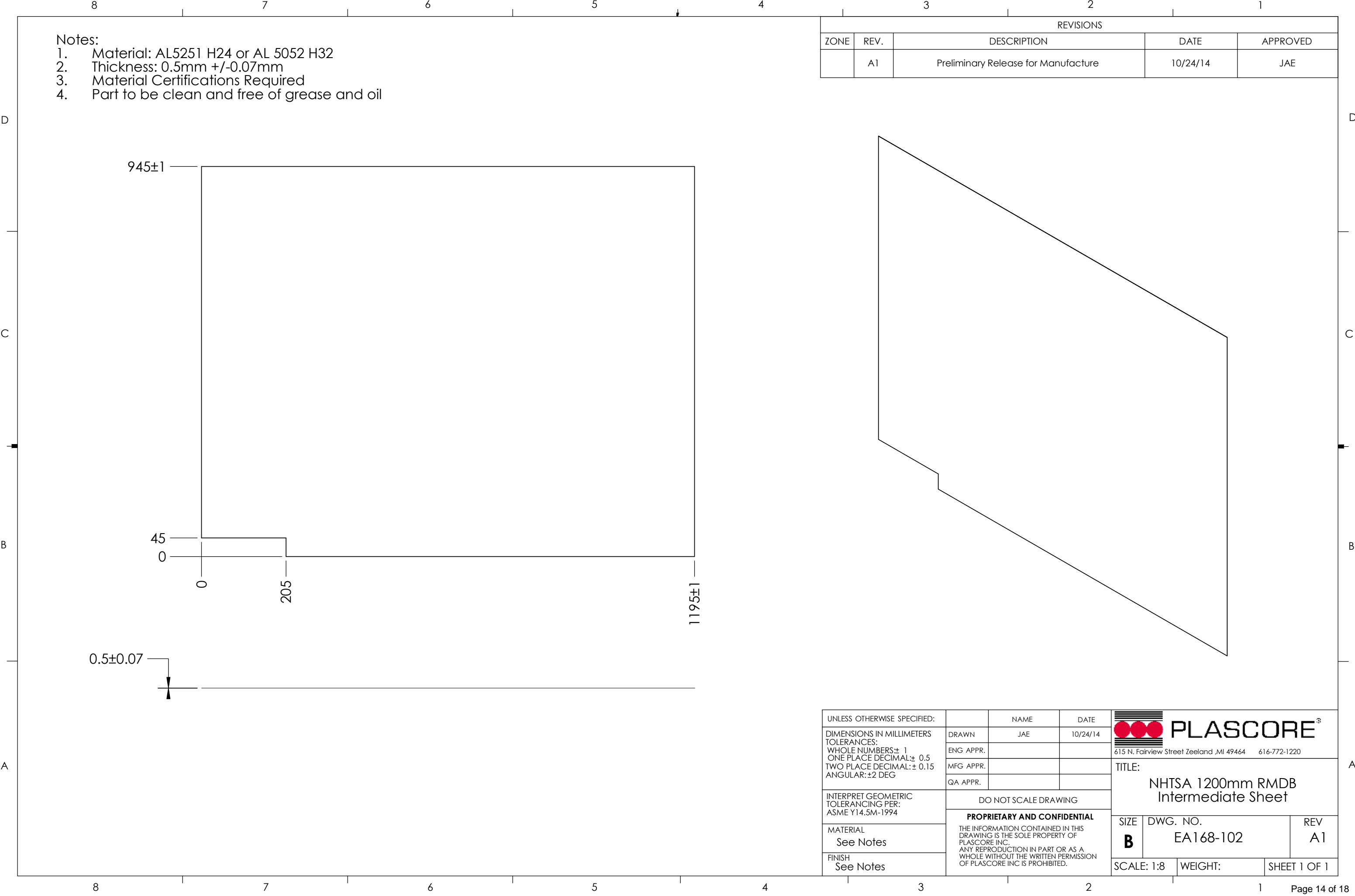
UNLESS OTHERWISE SPECIFIED:		NAME		DATE		 <div>PLASCORE<sup>®</sup></div> <div>615 N. Fairview Street Zeeland ,MI 49464 616-772-1220</div>			
DIMENSIONS IN MILLIMETERS TOLERANCES: WHOLE NUMBERS± 1 ONE PLACE DECIMAL± 0.5 TWO PLACE DECIMAL± 0.15 ANGULAR:±2 DEG		DRAWN		JAE		10/27/14			
		ENG APPR.							
		MFG APPR.							
		QA APPR.							
INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5M-1994		DO NOT SCALE DRAWING				TITLE:  NHTSA 1200mm RMDB Assembly Drawing			
PROPRIETARY AND CONFIDENTIAL									
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF PLASCORE INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF PLASCORE INC IS PROHIBITED.									
MATERIAL  See BOM				SIZE  B		DWG. NO.  EA168-001		REV  A1	
FINISH  See Work Order				SCALE: 1:16		WEIGHT:		SHEET 1 OF 1	

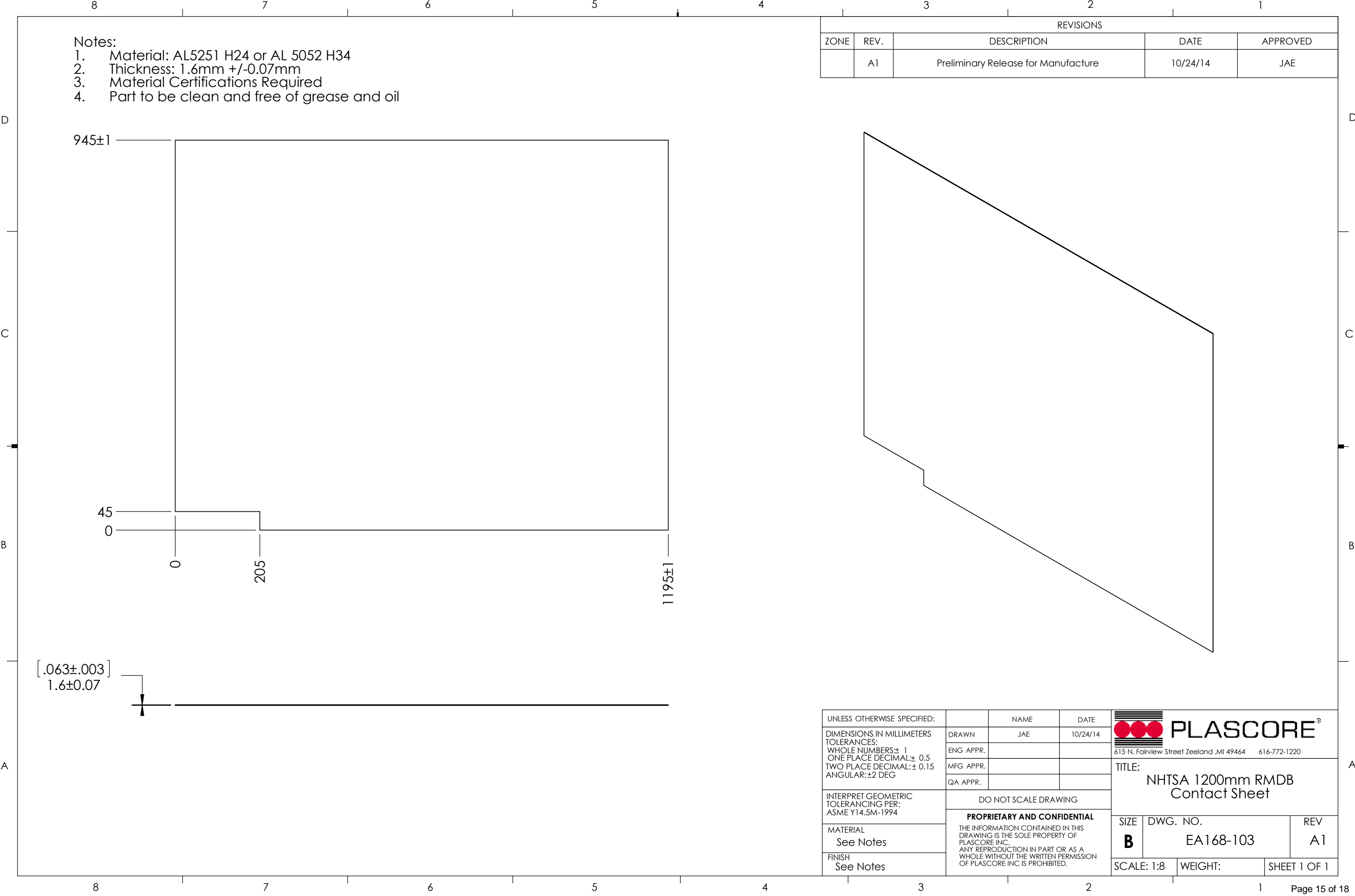
- Notes:
- 1. Material: AL 5251 H22 or AL 5052 H32
  - 2. Thickness: 3.0mm +/-0.25mm
  - 3. Material Certifications Required
  - 4. Part to be clean and free of grease and oil

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A1	Preliminary Release to Manufacture	10/24/14	JAE



UNLESS OTHERWISE SPECIFIED:		NAME	DATE	 <b>PLASCORE<sup>®</sup></b> 615 N. Fairview Street Zeeland ,MI 49464 616-772-1220		
DIMENSIONS IN MILLIMETERS TOLERANCES: WHOLE NUMBERS:± 1 ONE PLACE DECIMAL:± 0.5 TWO PLACE DECIMAL:± 0.15 ANGULAR:±2 DEG		DRAWN	JAE	10/24/14	TITLE:  NHTSA 1200mm RMDB Backplate	
		ENG APPR.				
		MFG APPR.				
		QA APPR.				
INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5M-1994		DO NOT SCALE DRAWING			SIZE  <b>B</b>	
MATERIAL See Notes		<b>PROPRIETARY AND CONFIDENTIAL</b> THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF PLASCORE INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF PLASCORE INC IS PROHIBITED.				
FINISH See Notes						
					DWG. NO.  EA168-101	REV  A1
		SCALE: 1:8			WEIGHT:	SHEET 1 OF 1





Notes:

1. Material: AL5251 H24 or AL 5052 H34
2. Thickness: 1.6mm +/-0.07mm
3. Material Certifications Required
4. Part to be clean and free of grease and oil

945±1

45

0

0

205

1195±1

[.063±.003]  
1.6±0.07



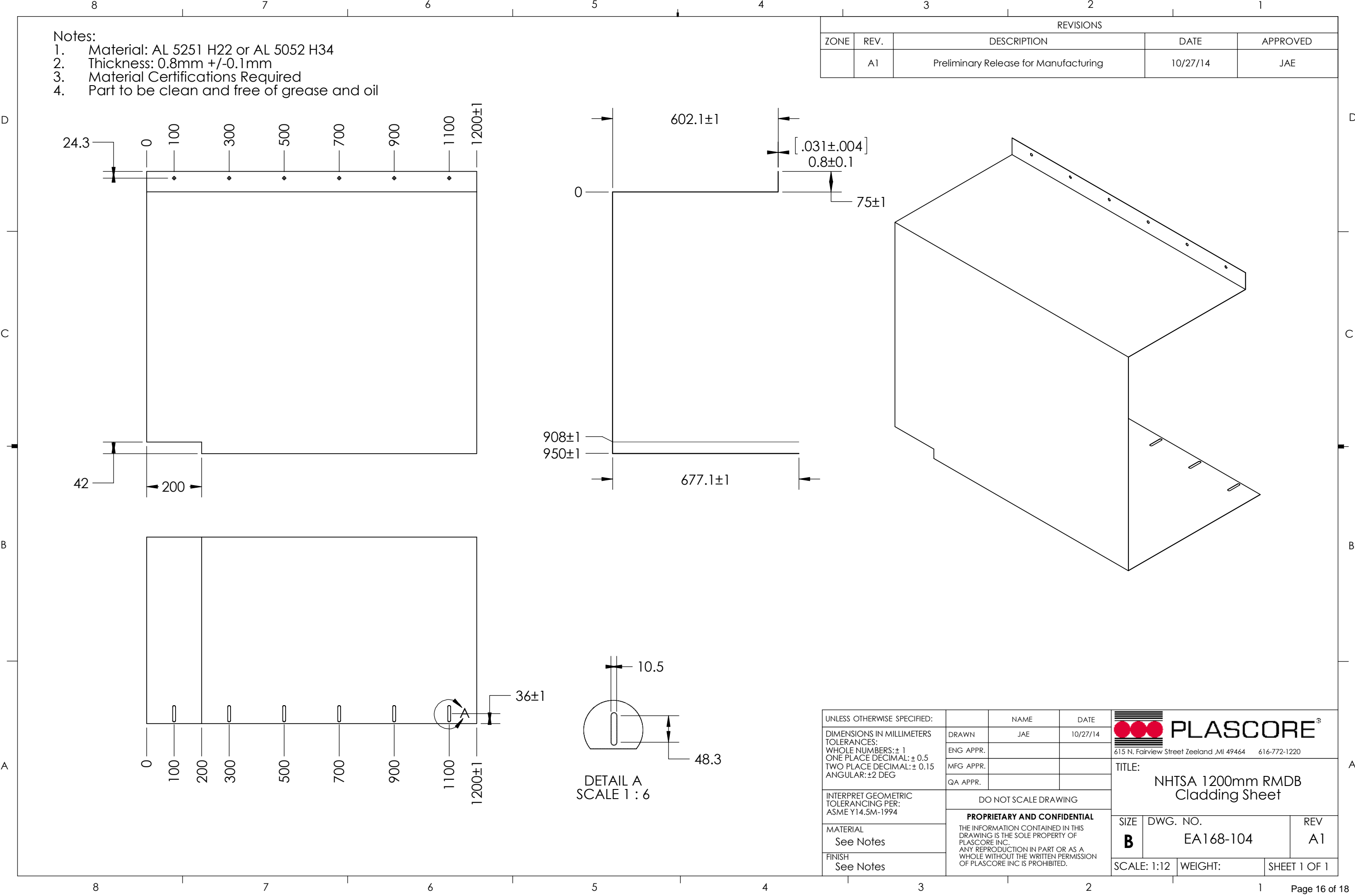
**PLASCORE**<sup>®</sup>

615 N. Fairview Street Zeeland ,MI 49464 616-772-1220

TITLE:  
NHTSA 1200mm RMDB  
Contact Sheet


SIZE	DWG. NO.	REV
<b>B</b>	EA168-103	A1

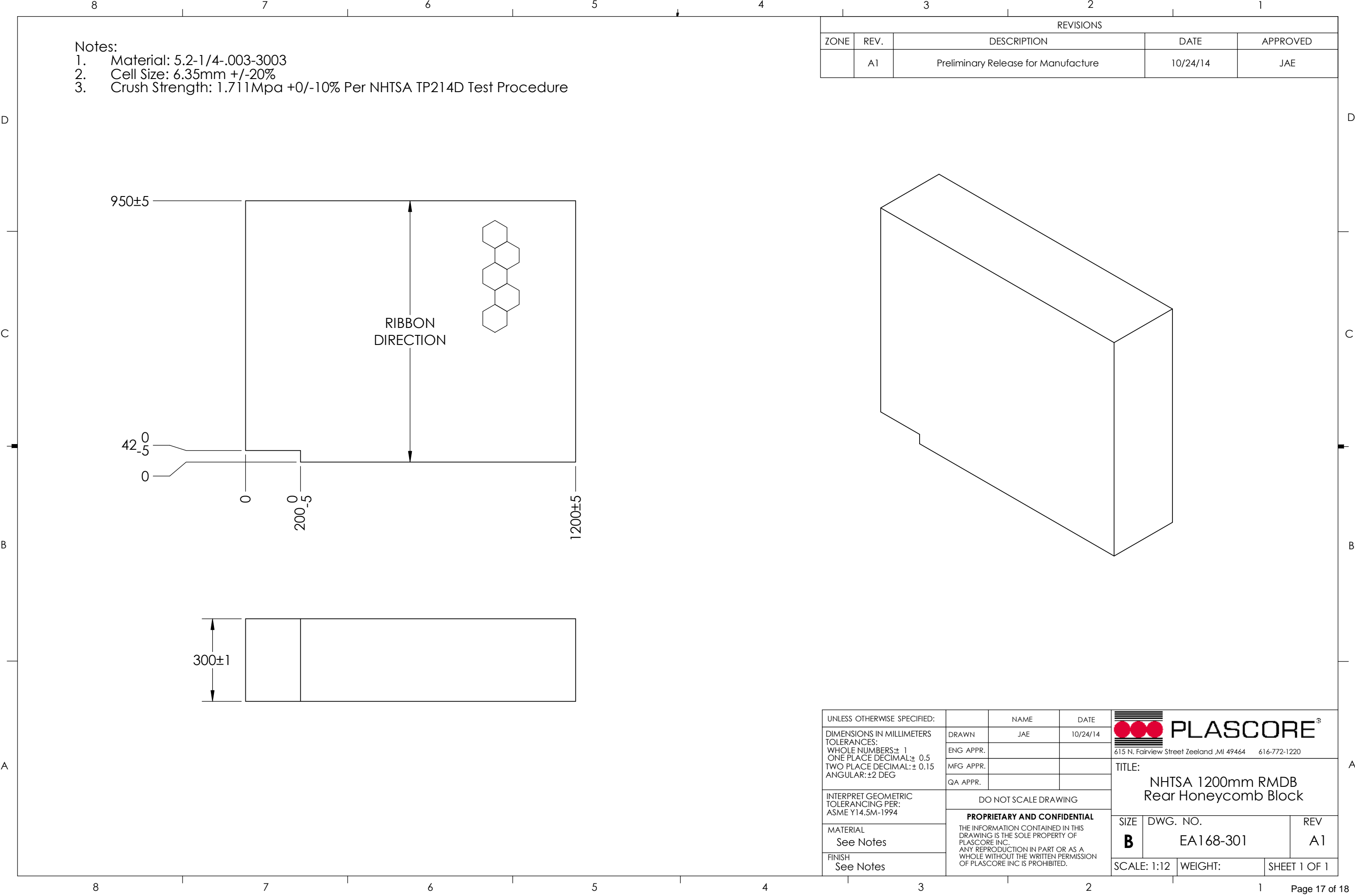
SCALE: 1:8	WEIGHT:	SHEET 1 OF 1
------------	---------	--------------



- Notes:
1. Material: AL 5251 H22 or AL 5052 H34
  2. Thickness: 0.8mm +/-0.1mm
  3. Material Certifications Required
  4. Part to be clean and free of grease and oil


REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A1	Preliminary Release for Manufacturing	10/27/14	JAE

UNLESS OTHERWISE SPECIFIED:		NAME	DATE	 <b>PLASCORE<sup>®</sup></b> 615 N. Fairview Street Zeeland ,MI 49464 616-772-1220		
DIMENSIONS IN MILLIMETERS TOLERANCES: WHOLE NUMBERS: ± 1 ONE PLACE DECIMAL: ± 0.5 TWO PLACE DECIMAL: ± 0.15 ANGULAR: ±2 DEG	DRAWN	JAE	10/27/14	TITLE:  NHTSA 1200mm RMDB Cladding Sheet		
	ENG APPR.					
	MFG APPR.					
	QA APPR.					
INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5M-1994	DO NOT SCALE DRAWING			SIZE  <b>B</b>		
<b>PROPRIETARY AND CONFIDENTIAL</b>  THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF PLASCORE INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF PLASCORE INC IS PROHIBITED.						
MATERIAL  See Notes				DWG. NO.  EA168-104		REV  A1
FINISH  See Notes				SCALE: 1:12		WEIGHT:
						SHEET 1 OF 1



- Notes:
1. Material: 5.2-1/4-.003-3003
  2. Cell Size: 6.35mm +/-20%
  3. Crush Strength: 1.711Mpa +0/-10% Per NHTSA TP214D Test Procedure

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A1	Preliminary Release for Manufacture	10/24/14	JAE

UNLESS OTHERWISE SPECIFIED:		NAME	DATE	<div><b>PLASCORE<sup>®</sup></b> 615 N. Fairview Street Zeeland ,MI 49464 616-772-1220</div>	
DIMENSIONS IN MILLIMETERS TOLERANCES: WHOLE NUMBERS± 1 ONE PLACE DECIMAL:± 0.5 TWO PLACE DECIMAL:± 0.15 ANGULAR:±2 DEG	DRAWN	JAE	10/24/14		
	ENG APPR.				
	MFG APPR.				
	QA APPR.			TITLE: NHTSA 1200mm RMDB Rear Honeycomb Block	
INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5M-1994	DO NOT SCALE DRAWING			SIZE <b>B</b>	DWG. NO. EA168-301
MATERIAL See Notes	THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF PLASCORE INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF PLASCORE INC IS PROHIBITED.			REV A1	
FINISH See Notes				SCALE: 1:12	WEIGHT: SHEET 1 OF 1



